Plasma Processes, Inc.

A Novel Radiation Shielding Material

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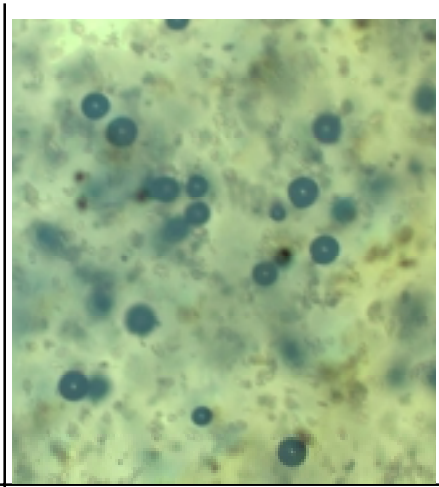
Description and Objectives

• Develop a castable epoxy with uniformly dispersed boron coated polyethylene particles that will provide lightweight structural radiation shielding from:

- ♦ Galactic Cosmic Rays and Solar Energetic Particles via Polyethylene Particles in an Epoxy Matrix.
- ♦ Secondary Neutron Formation via Boron Coating on Particles.

• Can be repaired with ease in case of damage while having sufficient mechanical properties to be considered a structural element

• Dispersion of reinforcement phase is less challenging than in composites with continuous fibers or different types of particles.



Spherical polyethylene particles 35 µm in diameter dispersed in an epoxy matrix.
Magnification: 50x

Approach

• During Phase I, two coating techniques will be evaluated for coating polyethylene particles.

• Coating prevents uneven distribution from sedimentation due to difference in densities of polyethylene and boron in epoxy matrix

• Metallurgical characterization will be performed.

• Simulations to determine radiation shielding properties will be performed.

• Extensive mechanical properties and radiation testing will be performed in Phase II.

Subcontractor

BAE SYSTEMS Analytical Solutions, Inc.

Schedule and Deliverables

• 6 months for development of the processes, fabrication of test articles, and characterization.

• Techniques will be reported for producing boron coated polyethylene reinforced epoxy composites.

• Simulated radiation shielding properties of boron coated polyethylene reinforced epoxy composites will be reported.

NASA and Commercial Applications

• Improved radiation shielding for space transportation vehicles, orbiters, landing vehicles, rovers, habitats, ISS.

• Commercial Applications Include: shielding for particle accelerators, nuclear reactors, radioactive biological and nuclear waste containment vessels, satellite hardware, high-altitude fighter planes, and commercial airliners